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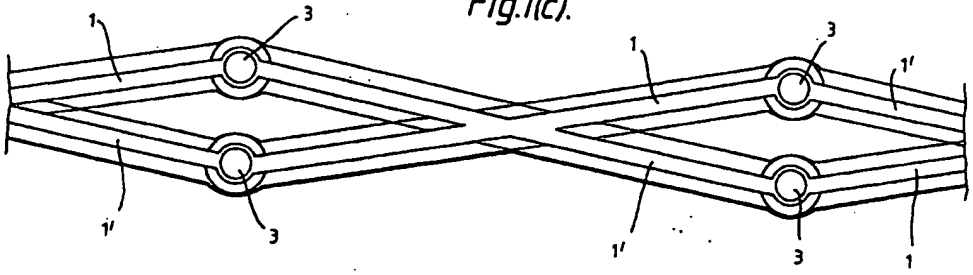
(58) Field of search
UK CL (Edition J) H1R RAC RAL RAN RAP RBD
INT CL[4] H05K

(54) **Conductive track arrangement on a printed circuit board**

(57) A printed circuit board includes conductive tracks that alternate between two layers and repeatedly cross one another in a manner to simulate conventional twisted wirings. The tracks are formed by interconnecting individual segments 1, 1' formed on the two layers by vias 3. The layers may be provided with conductive areas to provide shielding, and further shielding layers may also be added. The resulting PCB may be of a large-scale type that can be used to replace conventional twisted and shielded wiring.

Fig.1(c).



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

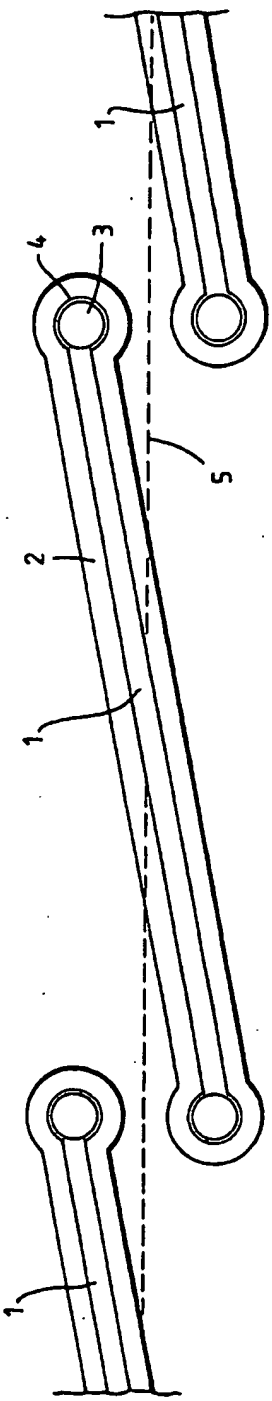


Fig.1(a).

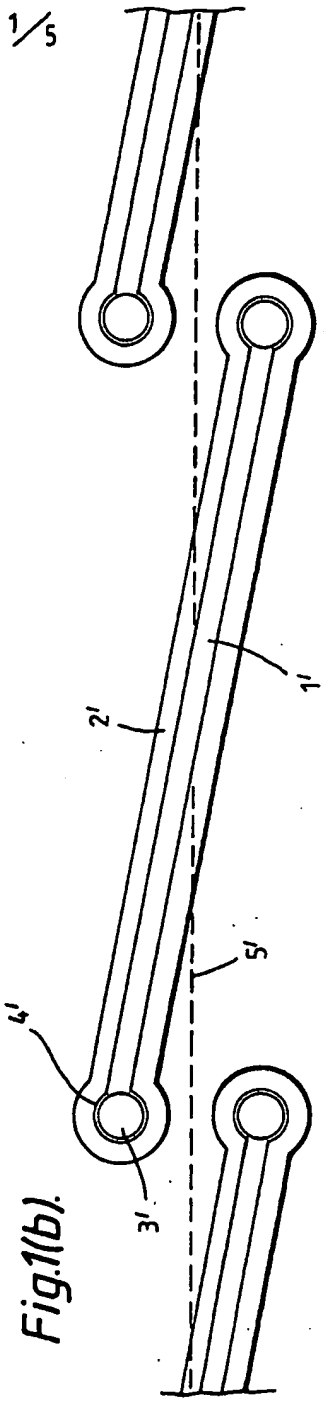


Fig.1(b).

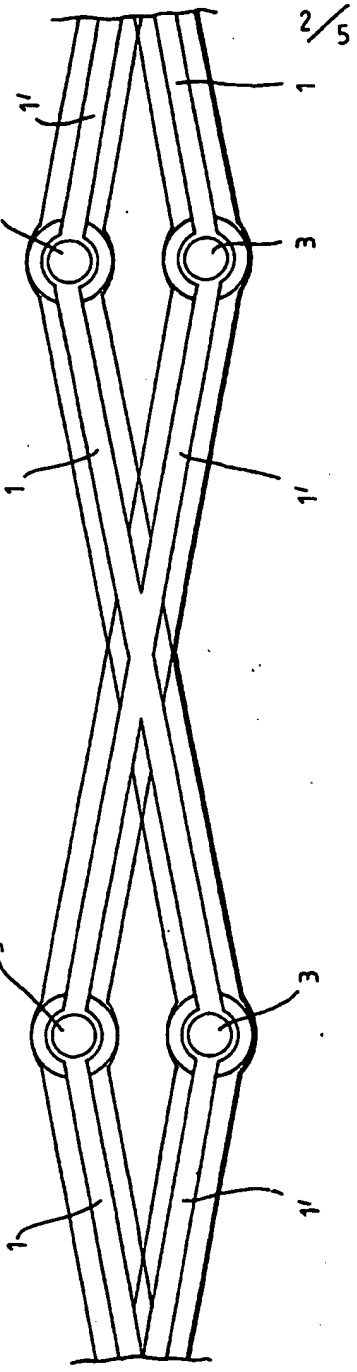


Fig.1(c).

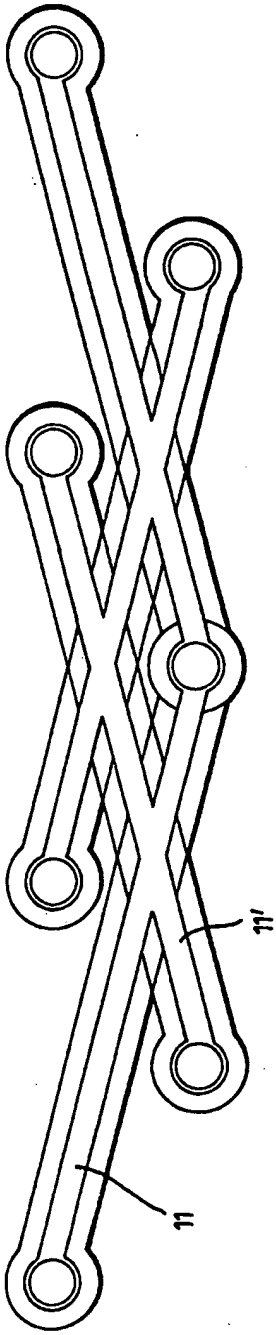


Fig.2(c).

Fig.2(a).

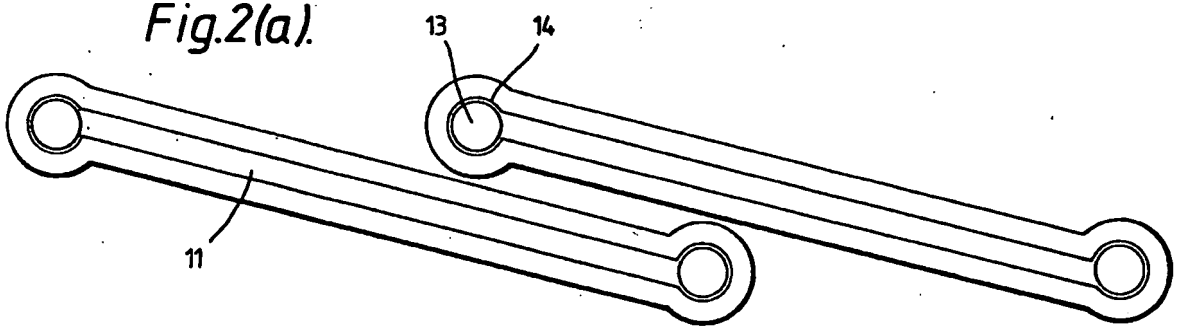


Fig.2(b).

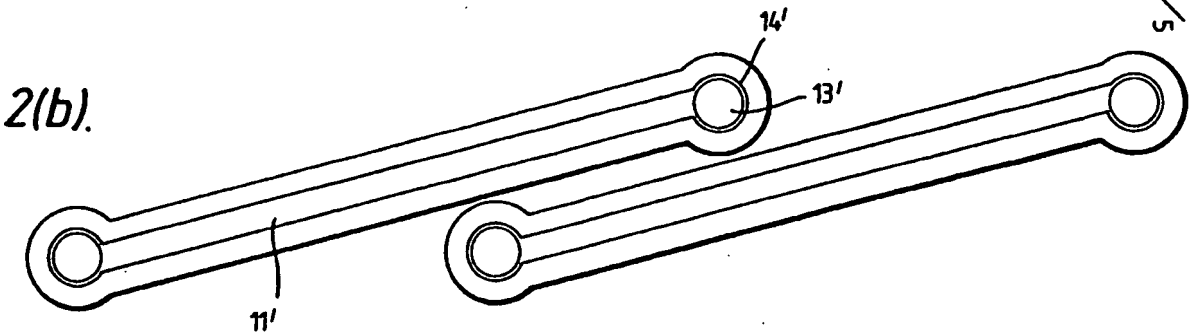


Fig.3(a).

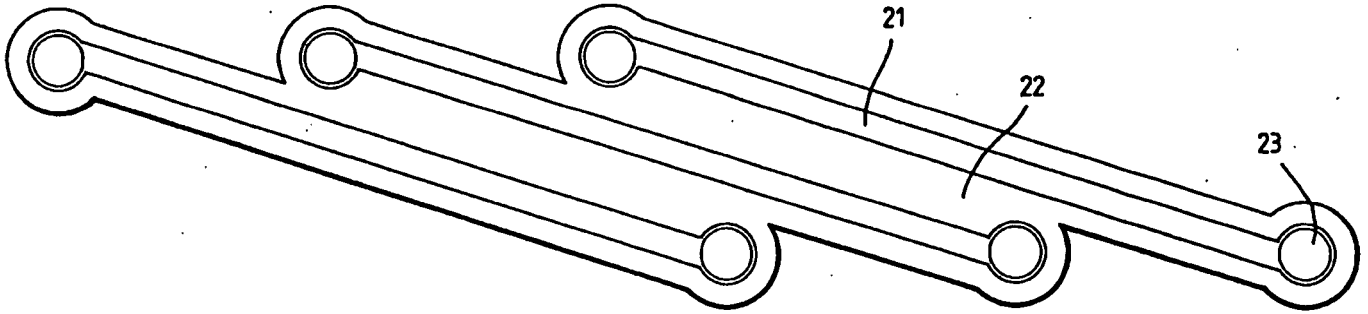
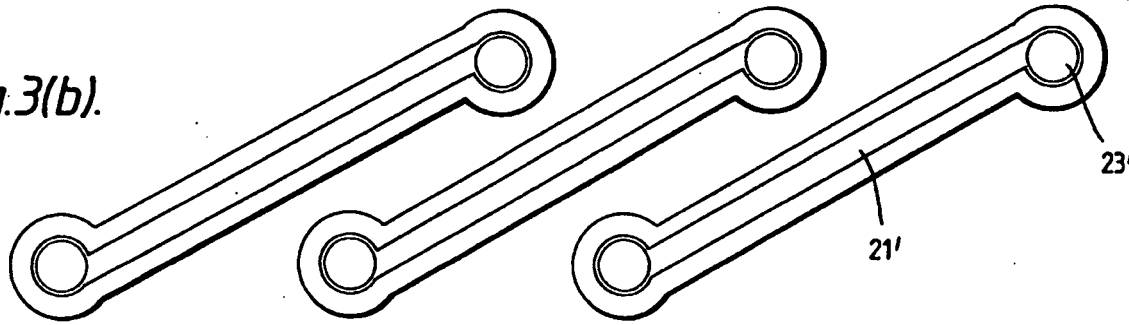


Fig.3(b).



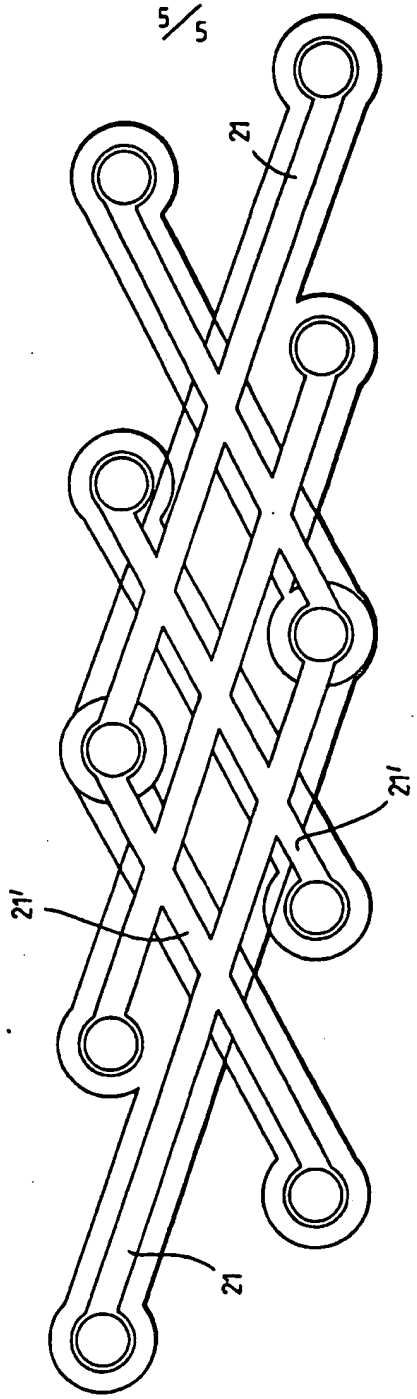


Fig.3(c).

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PRINTED CIRCUIT BOARD

This invention relates to a printed circuit board (PCB), and in particular to a large-scale PCB that may be used to replace conventional wiring arrangements in, for example, an aircraft.

Conventional wiring in an aircraft, such as that interconnecting avionics units for example, generally consists of bundles of a number of individual wires. Such bundles are, however, disadvantageous in that they are large and heavy, and furthermore can make it difficult to identify a particular wire when, for example, fault checking. For such reasons it would be desirable to replace such wiring with a large-scale PCB, having dimensions of up to about 1m. Individual wires could then be replaced by conductive tracks on the PCB. A problem with this however is that conventional wiring is provided with means of shielding the wiring from unwanted electromagnetic-interference. Such interference may be created by sources external of the wiring, or may be generated by currents flowing in the wiring. Individual wires may be regarded as 'emissive', indicating that they generate such interference, or 'susceptible', indicating that they are particularly vulnerable to such interference.

Conventional ways of mitigating problems with such interference includes providing copper shielding, and twisting wires together. In the past it has been difficult

to provide corresponding shielding to wires formed as tracks on a PCB.

According to the present invention there is provided a printed circuit board comprising two layers, each said layer including a linear series of individual conductive track segments, said series being generally superimposed on each other and extending in the same direction, means being provided at the ends of each segment to connect a said segment in one layer to a said segment in the other layer.

By means of this arrangement is is possible to construct conductive tracks, by connecting segments from both layers, that 'interweave' and overly each other in a manner to simulate the twisting of conventional wiring.

In a particularly preferred arrangement the track segments in each said layer are disposed at an angle to the direction of the series, the segments in one layer being angled in the opposite sense to those in the other layer. By 'angled in the opposite sense' it is meant that if, say, the segments cross an imaginary line extending in the direction of that series from left to right, the other series of segments will cross the line from right to left.

In one embodiment alternate segments in one layer are interconnected by a segment in the other layer. This arrangement provides two tracks simulating a two-core twist.

In another embodiment every third segment in one layer is interconnected with a segment from the other layer. This

provides three tracks simulating a three-core twist. Naturally this process can be extended; for example every fourth segment being interconnected to define four tracks, simulating a conventional wire of a four-core twist.

Preferably the interconnection between two track segments is by means of a via comprising a bore extending between said layers normal to the plane of the printed circuit board, the interior surface of the bore being provided with a conductive coating.

Such an arrangement allows tracks to be defined that simulate conventional twisted wires and provide similar shielding. It is preferred however to provide the PCB with further shielding in the form of one or more areas of conductive materials (eg copper) on the regions of said layers not defining said track segments, and/or such areas formed on further layers of said PCB. Such areas may be substantially uninterrupted, or may comprise complementary areas formed on adjacent layers. Where such areas are formed on layers not defining tracks, the areas may extend over the whole layer, or only that region overlying the tracks defined on other layers.

Some embodiments of the invention will now be described by way of example and with reference to the accompanying drawings, in which:-

Figures 1(a) and (b) each show a part of a track segment series formed on a layer, with Figure 1(c) showing

the segments of Figures (a) and (b) superimposed and interconnected to form two tracks,

Figures 2(a), (b) and (c) are views similar to Figure 1 but showing a three track arrangement,

Figures 3(a), (b) and (c) are similar to Figures 1 and 2, but showing a four track arrangement.

Referring firstly to Figure 1(a) there is shown a part of a series of conductive track segments 1 formed on a PCB substrate layer formed of, eg, epoxy glass. Such segments may be formed by conventional techniques, such as by removing (for example by etching) the areas 2 surrounding the segments from a substrate layer covered in copper. At the ends of each segment 1 are formed vias 3 by means of which the segments 1 may be connected to corresponding segments formed on an adjacent layer. Each via 3 consists of a hole extending through the layer generally at right-angles to the surface of the layer, the interior surface of the hole being provided with a conductive coating 4.

The segments 1 of Figure 1(a) are arranged generally in a line extending from left to right in the Figure. Each individual segment 1 is however disposed at an angle to that line, as illustrated by imaginary centre line 5. Each segment 1 is of such a length and at such an angle that the ends of successive segments 1 lie generally adjacent on either side of the imaginary centre line 5.